

## **General Principles**

**28%–30%**

### **Biochemistry and molecular biology**

- gene expression: DNA structure, replication, and exchange
- gene expression: transcription, including defects
- gene expression: translation, including defects
- structure and function of proteins
- energy metabolism, including metabolic sequences and regulation
- metabolic pathways of small molecules and associated diseases
- biosynthesis and degradation of other macromolecules and associated abnormalities, complex carbohydrates, glycoproteins, and proteoglycans

### **Biology of cells**

- structure and function of cell components
- signal transduction
- cell-cell and cell-matrix adhesion
- cell motility
- intracellular sorting
- cellular homeostasis
- cell cycle
- structure and function of basic tissue components
- adaptive cell response to injury
- intracellular accumulations
- mechanisms of injury and necrosis
- apoptosis

### **Human development and genetics**

- embryogenesis: programmed gene expression, tissue differentiation and morphogenesis, homeotic genes; developmental regulation of gene expression
- congenital abnormalities: principles, patterns of anomalies, dysmorphogenesis
- principles of pedigree analysis
- population genetics: Hardy-Weinberg law, founder effects, mutation-selection equilibrium
- genetic mechanisms
- clinical genetics

### **Biology of tissue response to disease**

- inflammation, including cells and mediators
- reparative processes
- neoplasia

### **Gender, ethnic, and behavioral considerations affecting disease treatment and prevention**

- progression through the life cycle, including birth through senescence
- psychologic and social factors influencing patient behavior
- patient interviewing, consultation, and interactions with the family
- medical ethics, jurisprudence, and professional behavior

### **Multisystem processes**

- nutrition
- temperature regulation
- adaptation to environmental extremes
- fluid, electrolyte, and acid-base balance and disorders

### **Pharmacodynamic and pharmacokinetic processes**

- general principles
- general properties of antimicrobials
- general properties of antineoplastic agents and immunosuppressants

**Microbial biology and infection**

microbial classification and its basis  
bacteria and bacterial diseases  
viruses and viral diseases  
fungi and fungal infections  
parasites and parasitic diseases  
principles of sterilization and pure culture technique

**Immune responses**

production and function of granulocytes, natural killer cells, and macrophages  
production and function of T lymphocytes, T-lymphocyte receptors  
production and function of B lymphocytes and plasma cells; immunoglobulin and antibodies: structure and biologic properties  
antigenicity and immunogenicity; antigen presentation; cell activation/regulation; tolerance/clonal deletion  
immunologic mediators: chemistry, function, molecular biology, classic and alternative complement pathways, cytokines, chemokines  
immunogenetics; MHC structure and function, class I, II molecules; erythrocyte antigens  
immunizations: vaccines, protective immunity  
alterations in immunologic function  
immunologically mediated disorders  
immunologic principles underlying diagnostic laboratory tests  
innate immunity

**Quantitative methods**

fundamental concepts of measurement  
fundamental concepts of study design  
fundamental concepts of hypothesis testing and statistical inference

## Hematopoietic and Lymphoreticular Systems

3%–5%

### Normal processes

embryonic development, fetal maturation, and perinatal changes  
organ structure and function  
cell/tissue structure and function  
repair, regeneration, and changes associated with stage of life

### Abnormal processes

infectious, inflammatory, and immunologic disorders  
traumatic and mechanical injury  
neoplastic disorders  
metabolic and regulatory disorders  
vascular and endothelial disorders  
systemic disorders affecting the hematopoietic and lymphoreticular system  
idiopathic disorders

### Principles of therapeutics

mechanisms of action, use, adverse effects of drugs for treatment of disorders of the hematopoietic system  
other therapeutic modalities (eg, splenectomy, chelating agents, radiation therapy for lymphomas, plasmapheresis)

## Central and Peripheral Nervous Systems

11%–13%

### Normal processes

embryonic development, fetal maturation, and perinatal changes  
organ structure and function  
cell/tissue structure and function  
repair, regeneration, and changes associated with stage of life

### Abnormal processes

infectious, inflammatory, and immunologic disorders  
traumatic and mechanical disorders  
neoplastic disorders  
acquired metabolic and regulatory disorders  
vascular disorders  
systemic disorders affecting the nervous system  
idiopathic disorders affecting the nervous system  
congenital disorders, including metabolic  
degenerative disorders  
paroxysmal disorders  
disorders of special senses  
psychopathologic disorders, processes and their evaluation

### Principles of therapeutics

mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the nervous system  
other therapeutic modalities (eg, radiation, CFS shunting, surgery)

## **Skin and Related Connective Tissue**

**2%–4%**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including barrier functions, thermal regulation, eccrine function
- repair, regeneration, and changes associated with stage of life or ethnicity
- skin defense mechanisms and normal flora

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic, regulatory, and structural disorders
- vascular disorders
- systemic disorders affecting the skin

### **Principles of therapeutics**

- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the skin/connective tissue
- other therapeutic modalities (eg, laser, tattoo removal, cryotherapy)

## **Musculoskeletal System**

**5%–7%**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic, regulatory, and structural disorders
- vascular disorders
- systemic disorders affecting the musculoskeletal system
- idiopathic disorders
- degenerative disorders

### **Principles of therapeutics**

- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the musculoskeletal system
- other therapeutic modalities (eg, radiation, surgery, casts, rehabilitation)

## Respiratory System

8%–10%

### Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including surfactant formation, alveolar structure
- repair, regeneration, and changes associated with stage of life
- pulmonary defense mechanisms and normal flora

### Abnormal processes

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic, regulatory, and structural disorders
- vascular and circulatory disorders
- systemic disorders affecting the respiratory system

### Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the respiratory system
- other therapeutic modalities (eg, oxygen therapy, nasal CPAP, mechanical ventilation, physical therapy, surgical procedures, including transplantation)

## Cardiovascular System

11%–13%

### Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

### Abnormal processes

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders
- vascular disorders
- systemic diseases affecting the cardiovascular system
- congenital disorders of the heart and central vessels

### Principles of therapeutics

- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the cardiovascular system
- other therapeutic modalities (eg, pacemakers, angioplasty, valves, grafts, other surgical procedures)

## **Gastrointestinal System**

**7%–9%**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life
- gastrointestinal defense mechanisms and normal flora

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders
- vascular disorders
- systemic disorders affecting the gastrointestinal system

### **Principles of therapeutics**

- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the gastrointestinal system
- other therapeutic modalities (eg, surgical procedures, stents, feeding tubes)

## **Renal/urinary System**

**7%–9%**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders
- vascular disorders
- systemic diseases affecting the renal system

### **Principles of therapeutics**

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the renal and urinary system
- other therapeutic modalities (eg, dialysis, renal transplantation)

## **Reproductive System**

**4%–6%**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- reproductive system defense mechanisms and normal flora

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory processes
- systemic disorders affecting reproductive function
- disorders relating to pregnancy, the puerperium, and the postpartum period

### **Principles of therapeutics**

- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the reproductive system and management of normal reproductive function
- other therapeutic modalities affecting the reproductive system (eg, tampons)

## **Endocrine System**

**5%–7%**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including hormone synthesis, secretion, action, and metabolism
- repair, regeneration, and changes associated with stage of life

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory processes
- vascular disorders
- systemic disorders affecting the endocrine system
- idiopathic disorders

### **Principles of therapeutics**

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the endocrine system
- other therapeutic modalities (eg, surgery, radiation)